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ABSTRACT

This is the fifth of six guidebooks on minimum course content for first-year algebra; it includes operations with radicals, solutions of equations involving radicals or rational expressions, the distance formula, slope, and the slope-intercept form of the equation of a line. Course goals are stated, performance objectives listed, textbook references given, and teaching strategies suggested. Pretest and posttest items are included, plus an annotated list of three references. For other booklets in this set, see ED 067 283, ED 067 284, ED 067 296, and SE 016 505. (DT)

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AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

DADE COUNTY PUBLIC SCHOOLS

Algebra 1t

5215.15

Mathematics

DIVISION OF INSTRUCTION • 1971

SE 016 504

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QUINMESTER MATHEMATICS

COURSE OF STUDY

FOR

Algebra 1t

5215.15

(EXPERIMENTAL)

Written by

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for the

DIVISION OF INSTRUCTION
Dade County Public Schools
Miami, Florida 33132
1971-72

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PREFACE

The following course of study has been designed to set a minimum standard for student performance after exposure to the material described and to specify sources which can be the basis for the planning of daily activities by the teacher. There has been no attempt to prescribe teaching strategies; those strategies listed are merely suggestions which have proved successful at some time for some class.

The course sequence is suggested as a guide; an individual teacher should feel free to rearrange the sequence whenever other alternatives seem more desirable. Since the course content represents a minimum, a teacher should feel free to add to the content specified.

Any comments and/or suggestions which will help to improve the existing curriculum will be appreciated. Please direct your remarks to the Consultant for Mathematics.

All courses of study have been edited by a subcommittee of the Mathematics Advisory Committee.

COURSE DESCRIPTION

Further work in radicals and problem solving, and an introduction to graphing in the Cartesian plane. Includes operations with radicals, solution of equations involving radicals or rational expressions, the distance formula, slope, and the slope-intercept form of the equation of a line.

Designed for the student who has mastered the skills and concepts of Algebra 1s.

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OVERALL GOALS

The student will:

1. Develop his skill in solving first and second degree equations and inequalities.

2. Begin to understand the concepts of graphing linear equations and inequalities.

3. Develop further understanding of the structure of the real numbers through work with radicals.

KEY TO REFERENCES

(*State Adopted)

* D - Dolciani, Mary; Wooten, William: Beckenbach, Edwin; Jurgensen, Ray; and Donnelly, Alfred. Modern School Mathematics, Algebra 1. New York: Houghton Mifflin, 1967.

N - Nichols, Eugene D.. Modern Elementary Algebra. New-York: Holt, Rinehart, and Winston, 1961.

* PL - Payne, Joseph; Zamboni, Floyd; and Lankford, Francis. Algebra One. New York: Harcourt, Brace and World, 1969.

* PA - Pearson, Helen R. and Allen, Frank B.. Modern Algebra: A Logical Approach, Book One. Boston: Ginn and Co., 1964.

[1] - The number in the block preceeding an objective indicates the number of the state assessment standard to which the objective is related.

PERFORMANCE OBJECTIVES

I. Radicals

The student will:

4 1. Express a radical in simplest form.

4 2. Multiply radical expressions.

3. Simplify radical expressions.

4 4. Add and subtract radical expressions.

5. Solve equations involving radicals.

II. Open Sentences in One Variable

The student will:

1. Solve equations involving rational expressions composed of second-degree polynomials in one variable.

12 2. Solve problems involving rational expressions composed of second-degree polynomials in one variable.

III. Open Sentences in Two Variables

The student will:

1. Graph a linear equation in two variables.

2. Determine the slope of a line from its equation or graph.

3. Write a linear equation in slope- intercept form.

4. Write the equation of a line when given:

   a. The slope of the line and the y-intercept.
   b. The slope of the line and the coordinates of one point of the line.
   c. The coordinates of two points on the line.

5. Find the distance between two points by using the distance formula.

6. Graph linear inequalities in two variables.

7. Graph linear equations and inequalities involving absolute value.

RELATED OBJECTIVES	COURSE OUTLINE
	I. Radicals
	A. Simplification
I. 1	1. Simplest form
3	2. Rationalizing denominators
	B. Operations
4,2	1. Addition
	2. Subtraction
	3. Multiplication
	4. Division
5	C. Equations involving radicals
II. 1,2	II. Quadratic equations - solution and problems (review)
	III. Analytic Geometry of the line
	A. Linear equations
III. 1	1. Plotting
2	2. Slope
3,4	3. Slope intercept, point-slope, and 2 point forms
	B. Other topics
5	1. Distance
6	2. Linear inequalities
7	3. Absolute value

REFERENCES

COURSE OUTLINE	D	N	PL	PA
I. A.	(2 covered slightly) 437-442	324-330	279-282 284-287	(A 1 not covered) 512-514
B.	442-448	328-331 (1, 2 not covered)	282-288	508-518
C.	457-461	337-339	291-294	530-532
II.	448-457	361-363 364-381	358-379	382-394
III. A.	197-202 206-216 387-393	396-398 410-412 (2 covered slightly) (3 not covered)	178-196	428-432 452-459
B. 1.	431-437	(not covered)	289-291	443-4
2.	202-205	(not covered)	205-208	487-488
3.	(not covered)	(not covered)	209-210	489-490

STRATEGIES

(Keyed to Course Outline)

I. A. 1. PL is excellent in its treatment of simplifying radicals.

2. Students need much drill on this, give frequent short quizzes.

B. 1. Operations with radicals can be successfully compared (and contrasted) to operations with variables.

2. A nice way to introduce the topic of adding and subtracting radicals would be to start with a problem like $2x - 3y + 5x + 7y$ to simplify, continue with $2\sqrt{2} - 3\sqrt{3} + 5\sqrt{2} + 7\sqrt{3}$, and then pose the same problem in "disguise" $\sqrt{8} - \sqrt{27} + \sqrt{50} + 7\sqrt{3}$.

C. 1. Make sure students realize that when they square each side of an equation they are really multiplying by equal expressions.

2. Make sure students know <u>why</u> they must check the roots in the original equation. Remind them that it is agreed that $\sqrt{49} = 7$ so $\sqrt{49} = -7$ would be incorrect.

3. Even if more than one radical expression is involved in an equation it is still good practice to isolate one of them on one side. This way one avoids obtaining the product of two (2) radicals.

4. It may be pointed out that "extraneous" roots are not roots of the equation at all.

II. Nichols is rather thorough and explicit in his treatment of quadratic equations. It is a valuable source of examples and explanations.

III. A. 1. PL is excellent for these topics.

2. The point-slope formula is not given in the text of Dolciani, just in the teachers' manual.

III. B. 1. Linear inequalities are often a source of problems for the students, be sure to spend some time on them.

2. Perhaps the best way to approach graphing the solution set of inequalities is to graph the associated equation and "test" one of the two half-planes by substituting a point. If the point satisfies the inequality that half-plane will be solution set, if not, the other will be.

PRETEST

(Sample items should show readiness for this quin.)

Find the solution sets:

1. $|x| + 7 = 5$
2. $7 \geq |x + 4|$
3. $3x^2 - 8 = -2x$
4. $x^2 - 5x + 1 = 0$

Simplify:

5. $3x - 5x + 2xy - 3y + 6xy$

Multiply:

6. $(a + b)(a - b)$

Solve:

7. The sum of two (2) numbers is 23. Three times the smaller is four more than twice the larger. What are the two numbers?

KEY TO PRETEST

1. $\emptyset$
2. $\{x \mid -11 \leq x \leq 3\}$
3. $\{\frac{4}{3}, -2\}$
4. $\left\{\frac{5 \pm \sqrt{21}}{2}\right\}$
5. $8xy - 3y - 2x$
6. $a^2 - b^2$
7. 10, 13

POSTTEST (BY OBJECTIVES)

I.

1. Simplify:

   a. $\frac{1}{7}\sqrt{49\,x^3\,y^7}$ b. $\sqrt{48}$

2. Multiply:

   a. $(3\sqrt{2} - 5\sqrt{3})(4\sqrt{2} + \sqrt{3})$

   b. $(2\sqrt{15})(3\sqrt{10})$

3. Write without radicals in the denominator:

$$\frac{4 - \sqrt{2}}{2 + 5\sqrt{2}}$$

4. Simplify:

   a. $2\sqrt{450} + 9\sqrt{12} - 7\sqrt{48} - 3\sqrt{98}$

   b. $2\sqrt{2ab^2} + \sqrt{18a^3} - (a + 2b)\sqrt{2a}$

5. Find the solution set:

$$\sqrt{x + 7} + \sqrt{x - 1} - 2\sqrt{x + 2} = 0$$

II.

1. Find the solution set:

$$\frac{x}{3} + \frac{2x^2}{3x - 4} = \frac{9x - 2}{9}$$

2. A rectangular plot has length equal to double the width. If the length is increased by 40 ft. and the width by 6 ft., the area is doubled. Find the length and width.

III.

1. Graph $3x - 2y = 6$.

2. Find the slope of the equation above.

3. Write $3x - 2y = 6$ in slope - intercept form.

4. Write the equation of a line

   a. through (0,5) with slope $-\frac{2}{5}$.

   b. through (2,1) with slope $=\frac{1}{4}$.

   c. through (1,3) and (4,5) .

5. Find the distance from (1,3) to (4,5) .

   Graph:

6. $3x + y \leq 9$

7. $7 \geq |x + 4|$

KEY TO POSTTEST

I. 1. a. $|x||y^3|\sqrt{xy}$ b. $4\sqrt{3}$

2. a. $9 - 17\sqrt{6}$ b. $30\sqrt{6}$

3. $\frac{11\sqrt{2} - 9}{23}$

4. a. $9\sqrt{2} - 10\sqrt{3}$ b. $|2|b| + 3|a| - a - 2b|\sqrt{2a}$

5. $\{2\}$

II. 1. $\{\frac{4}{15}\}$

2. 30 feet x 60 feet

III. 1. (graph)

2. $\frac{3}{2}$

3. $y = \frac{3}{2}x - 3$

4. a. $y = -\frac{2}{5}x + 5$ b. $y = \frac{1}{4}x + \frac{1}{2}$

c. $y = \frac{2}{3}x + \frac{7}{3}$

5. $\sqrt{13}$

6. (graph)

7. (graph)

ANNOTATED BIBLIOGRAPHY

(Other sources)

1. Barron's Educational Series. Regents' Exams and Answers, Elementary Algebra. New York: 1965.

   Concise explanations and examples, numerous test items.

2. Dodes, Irving A., and Greitzer, Samuel L.. Algebra I: Its Structures, Logic and Methods. New York: Hayden, 1967.

   Good strategies and calendar.

3. Dressler, Isidore. Ninth Year Mathematics. New York: Amsco, 1966.

   Excellent explanations and problems.